Space Operations Management Office Services Catalog

Mission Unique Services

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CHANGE DISPOSITION AND REVISION

Revision/Change Number		
Revision 1	Original	April 7, 2000
Revision 2	Updated X-38 Test Support service description	September 7, 2000
	Changed Unit of Service definition for Launch Trajectory Support for STS	
	Changed description title referencing Unmanned On-Orbit Support for IMP-8 VHF service	
Revision 3	Updated X-38 Unit of Service description	October 10, 2000
Revision 4	Moved Space Network SA Terrestrial, Extra Capacity Service from Volume 1 to Volume 2	August 23, 2001

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Volume 2 – Mission Specific Services

This volume contains services that are specifically tailored to a mission in such a way that the sale of this service to other customers is not possible. Standard services are found in the CSOC Service Catalog Volume 1. The services contained below are in three main areas:

- Ground System Services: Human Space Flight Missions, Checkout and Launch Support, Expendable Launch Vehicle Telemetry Laboratory, and Hubble Space Telescope

- Launch Trajectory: Comprehensive Network Support for STS

- Ground Network: Unmanned on-orbit IMP-8 VHF.

Human Space Flight Ground Systems services provide the necessary capabilities (e.g. hardware, software, and sustaining engineering) and service activities (e.g., data systems operations and maintenance, scheduling, coordination, etc.) required for conducting pre-mission formulation and implementation and launch and mission operations execution.

STS Mission Services Ground System services are priced based on a STS mission month unit of service. The mission month unit price is derived by estimating the total cost to provide the service for the fiscal year of concern based on the number of STS flights planned for that year and dividing by 12 months. The estimation is based on historical actual costs, planned enhancements, and business experience any of which can either decrease or increase the service price. The month unit price varies from one fiscal year to the next depending on the number of Space Shuttle flights planned for that year, the duration of the flights, and the complexity of the flights. The month unit will account for utilizing the service for (1) mission formulation, (2) mission implementation, (3) mission execution, (4) associated tests and verifications, (5) associated training, (6) associated simulations, and (7) any post flight support.

ISS Mission Services Ground System services are priced based on an ISS increment month unit of service. The increment month unit is derived by estimating the total cost to provide the service for the fiscal year of concern based on the number of ISS increments planned for that year and dividing by 12 months. The estimation is based on historical actual costs, planned enhancements, and business experience. The month unit price varies from one fiscal year to the next depending on the number of increments planned for that year, the duration of the increments, the complexity of the increments, and whether a crew is onboard or not. The month unit will account utilizing the service for (1) increment formulation, (2) increment implementation, (3) increment execution, (4) associated tests and verifications, (5) associated training, (6) associated simulations, and (7) any post increment support.

Integrated Planning System

The service delivered to the subscriber is the Integrated Planning System (IPS) Ground System. This service provides to the subscriber the planning and analysis tools required to support long range mission and space vehicle assessments, trajectory design, mission and increment planning, pre-mission contingency analysis, ISS avionics reconfiguration, and direct mission support.

The IPS is an integrated space mission planning and analysis system that is able to support multiple flight programs. Major functions supported by IPS as subsystems (acronym in parenthesis) include:

- Flight activity (including on-board crew) planning and scheduling (CPS)

- Trajectory and attitude/orientation and communication coverage planning and analysis (FDD for STS)

- Spacecraft (on-board) inventory, logistics and maintenance planning (CMILP)

- Procedures development and documentation (PDAC)

- Spacecraft resources planning and analysis (RUPSM)

- Robotic (on-board manipulator) planning and analysis (RPF)

- ISS Avionics reconfiguration (IMARS)

Some of the IPS subsystems are supplied to the Houston Support Room at the Mission Control Center-Moscow as included in the ISS Houston Support Room Service. IPS subsystems are also supplied to the Payload Planning System at the MSFC Payload Operations Integration Center that support ISS operations integration and planning as included in the Payload Operations Integration Center Service.

The following Integrated Planning System services are available for selection.

Table 1.1-1. Integrated Planning System Services

Service ID	Service Title	Unit of Service
1.1.1.01	IPS STS Mission Planning and DOLILU Service at JSC	Mission Month
1.1.1.02	IPS ISS Core Mission Planning Service at JSC	Increment Month

IPS STS Mission Planning and DOLILU Service at JSC

The STS IPS Ground System service at the Johnson Space Center provides the ground systems for the functions of Mission Planning and Space Shuttle Day-of-Launch I-Load Updates (DOLILU).

IPS STS Mission Planning and DOLILU Service at JSC is priced based on a STS mission month unit of service.

The IPS STS Mission Planning Ground System services ensure at least 98% availability of nominal functions and in no case impact safety, mission success, or major program schedules.

Payload ground system services are provided for mission planning activities at a minimum availability of 99.75% for critical functions and reliability of at least 99.75% measured over an eight hour utilization period and in no case impact safety, mission success, or major program schedule milestones.

Space Shuttle Day-of-Launch I-Load Updates (DOLILU) are provided for a stand-alone subsystem of the Integrated Planning System (IPS). This service, although only near-real-time, supports a critical function, and will therefore be provided with a reliability of at least 99.5% for four hours (pre-launch) and will meet Level A IPS requirements, in no case compromising safety, mission success, or major program schedule milestones.

IPS ISS Core Mission Planning Service at JSC

The ISS Core IPS Ground System service at the Johnson Space Center provides the ground systems for the function of ISS Mission Planning.

IPS ISS Core Mission Planning Service at JSC is priced based on an ISS increment month unit of service.

Ground System Services ensure at least 98% availability of nominal functions and in no case impact safety, mission success, or major program schedules.

Mission Control Center (MCC) at JSC

The service delivered to the subscriber is the Mission Control Center Ground System. This service provides to the subscriber the CSOC capabilities, including hardware and software tools and facilities to accomplish Mission Control Center maintenance, sustaining engineering, and MCC facility operations for the NASA Human Space Flight missions. This includes providing the capabilities for telemetry data capture, processing distribution, recording and playback, spacecraft and payload command generation, uplinking, and management. It also includes supporting services to capture, process, distribute, and store voice, video, timing, tracking, weather, and status data to support all phases of Human Space Flight Operations in accordance with requirements. The Mission Control Center at the Johnson Space Center provides for the functions of basic Mission Control, Flight Dynamics, Spacecraft Analysis, Payload Analysis, Science Data Processing, and Data Storage.

The Mission Control function includes the basic command and telemetry management and ancillary functions. Real-time or near-real-time Flight Dynamics functions, such as the capabilities for navigation, maneuver planning, etc., for Human Space Flight missions are provided as an integral part of the Mission Control function.

The Spacecraft Analysis function provides the capability to process telemetry data to determine spacecraft performance, health, and safety exclusive of payload, experiment, and science systems performances. The data reduction and analysis are also included.

The Payload Analysis function provides the capability to process telemetry data to determine payload status and performance exclusive of the STS Spacecraft Analysis. This includes payload data reduction and trending and analysis of payload instrument telemetry. This does not include trending and analysis of science data.

The Science Data Processing function provides the ground system capability for the assessment, planning, processing, analysis, and delivery of space flight experiment scientific telemetry data. This function includes providing the capability for the capture and analysis of scientific telemetry data, the processing of the data into mission-specific data products, preparing for the distribution of user products to the scientific community, and the recovery, reprocessing, and preparation for redistribution of data upon request.

The Data Storage function provides for the storage, access, retrieval, and management of scientific and operational data for pre-mission, mission, and post-mission analysis, and reprocessing. Data Storage is provided as an integral part of the Mission Control function.

The following Mission Control Center services are available for selection.

Table 1.1-2. Mission Control Center Services

Service ID	Service Title	Unit of Service
1.1.1.11	MCC STS Service at JSC	Month
1.1.1.12	MCC ISS Core Service at JSC	Month
1.1.1.13	X-38 Tests Support Service at JSC	Test Support
1.1.1.14	ISS Automated Transfer Vehicle (ATV) MCC Support Service at JSC	Month
1.1.1.15	ISS H-II Transfer Vehicle (HTV) MCC Support Service at JSC	Month

MCC STS Service at JSC

The STS MCC Ground System service at the Johnson Space Center provides the ground systems for the functions of Mission Control, Flight Dynamics, Spacecraft Analysis, Payload Analysis, Science Data Processing, and Data Storage.

The MCC STS Ground System service is priced based on a monthly unit of service.

The Mission Control function (including the Flight Dynamics and Data Storage functions) achieves a 99.5% availability of critical function as defined in JSC 12804, MCC Level A requirements, and shall not impact safety, mission success, or major scheduled milestones availability. A 99.5% reliability for 20 hours of critical functions with a maximum restore time of one minute, as defined in JSC 12804, MCC Level A requirements is provided.

The Spacecraft Analysis function is provided at a minimum availability of 98% for nominal functions and in no case impact safety, mission success, or major program schedule milestones. This is provided in accordance with MCC System Functional Requirements and IPS Functional Requirements, JSC-13565, JSC-12804 Shuttle:

Space Shuttle Document (Flight Operations Volumes I & II, Launch & Landing Volumes I & II), PRD/OR/PSP/OD/20000; Space Shuttle Program, NSTS-7700 Volumes 8 & 14.

The Payload Analysis function is provided at a minimum availability of 99.75% for critical functions and reliability of at least 99.75% measured over an eight hour utilization period and in no case impacts safety, mission success, or major program schedule milestones.

The Science Data Processing function is provided at a minimum availability of 98% for nominal functions and in no case impacts safety, mission success, or major program schedule milestones.

MCC ISS Core Service at JSC

The ISS Core MCC ground system service at the Johnson Space Center provides the ground systems for the functions of Mission Control, ISS Core Spacecraft Analysis, Life Science Data Processing, and Data Storage.

The MCC ISS Core Ground System service is priced based on a monthly unit of service. The Mission Control function (including the Data Storage function) achieves a 99.5% availability of critical function as defined in JSC 12804, MCC Level A requirements, and shall not impact safety, mission success, or major scheduled milestones availability. A 99.5% reliability for 20 hours of critical functions with a maximum restore time of one minute, as defined in JSC 12804, MCC Level A requirements is provided. The Spacecraft Analysis function is provided at a minimum availability of 98% for nominal functions and in no case impact safety, mission success, or major program schedule milestones. This is provided in accordance with MCC System Functional Requirements and IPS Functional Requirements, JSC-13565, Station: ISSP Internal Ground Segment Specifications, SSP-54,500; ISSP Requirements Document PRD/OR/PSP/OD 30000.

The Science Data Processing function is provided at a minimum availability of 98% for nominal functions and in no case impacts safety, mission success, or major program schedule milestones.

X-38 Tests Support Service at JSC

The X-38 Tests Support service at JSC provides the facility, ground support equipment, and personnel necessary to support the X-38 "Flight Control Room" during Vehicle Systems Tests, Combined Systems Tests, X-38 Captive Carry Flight Tests, and X-38 Free-Flight Drop Tests.

The X-38 Tests Support service is priced based on a Test Support unit of service. The Test Support unit is based on the equivalent of 1.1 persons for GC, Communications Control, Houston Voice and Houston TV support and associated prorated facility costs for 8.5 hours for each flight test. The Test Support unit price is a set amount for the Johnson Space Center mission control ground systems support of the X-38 tests planned for each year from FY 1999 through FY 2004 .

This service achieves the standard 99.5% availability of critical function as defined in JSC 12804, MCC Level A requirements, and shall not impact safety, mission success, or major scheduled milestones availability. The ground system services provide a 99.5% reliability for 20 hours of critical functions with a maximum restore time of one minute, as defined in JSC 12804, MCC Level A requirements.

ISS Automated Transfer Vehicle (ATV) MCC Support Service at JSC

The ISS ATV MCC Ground System service at the Johnson Space Center provides the ground systems for the functions of pre-launch Joint Integrated Simulation support, mission control monitoring of the ATV for ISS support, formatting of ATV Control Center (ATV CC) generated Space Network (SN) flight dynamics vectors, and SN Support scheduling information, telemetry processing, and data storage.

Routine ATV flights (about one every 18 months) will be conducted automatically by the vehicle, with the aid of selected updates from the ground during the free flying phase. It is only the European Space Agency (ESA) ATV CC that will perform any ground uplinks to the ATV. Once attached to the ISS Russian Segment, the ATV will provide capabilities for ISS reboost, attitude control, debris avoidance, cargo transfer, and refuel, which are pre-planned operations and commanded by the ISS Russian Segment. Upon completion of its mission at the ISS, the ATV will un-dock from the ISS and depart for a destructive re-entry with waste cargo. The ATV will stay attached to the ISS for up to six months.

The ATV Mission Control monitoring by the ISS Flight Director at the MCC-H is provided by analysing a subset of the processed ATV telemetry available from the ATV CC.

The ATV Spacecraft Performance monitoring by the NASA Automated Rendezvous Officer at the MCC-H is provided by analysing the complete set of ATV telemetry available from the ATV CC.

The communications between the ATV CC and the MCC-H utilizes ESA ground segment telecommunication services for mission status information including voice and video conferencing capabilities.

The ISS ATV MCC Ground System service is priced based on a monthly unit of service.

The Mission Control monitoring function (including the Data Storage function) achieves a 99.5% availability of critical function as defined in JSC 12804, MCC Level A requirements, and shall not impact safety, mission success, or major scheduled milestones availability. A 99.5% reliability for 20 hours of critical functions with a maximum restore time of one minute, as defined in JSC 12804, MCC Level A requirements is provided.

The Spacecraft Performance monitoring function is provided at a minimum availability of 98% for nominal functions and in no case impact safety, mission success, or major program schedule milestones. This is provided in accordance with MCC System Functional Requirements and IPS Functional Requirements, JSC-13565, Station: ISSP Internal Ground Segment Specifications, SSP-54,500; ISSP Requirements Document PRD/OR/PSP/OD 30000.

ISS H-II Transfer Vehicle (HTV) MCC Support Service at JSC

The ISS HTV MCC Ground System service at the Johnson Space Center provides the ground systems for the functions of pre-launch Joint Integrated Simulation support, mission control monitoring of the HTV for ISS support, formatting of HTV Control Center (HTV CC) generated Space Network (SN) flight dynamics vectors and SN Support scheduling information, forward link format conversion, HTV spacecraft analysis, data processing, and data storage.

Routine HTV flights (two a year no closer than four months apart beginning in mid 2003) will be conducted automatically by the vehicle, with the aid of selected updates from the ground during the free flying phase. It is only the National Space Development Agency of Japan (NASDA) HTV CC that will perform any ground uplinks to the HTV. Once berthed to the ISS US Segment, the HTV cargo will become available for ISS use. Upon completion of its mission at the ISS, the HTV will un-berth from the ISS and depart for a destructive re-entry with its waste cargo. The HTV will stay attached to the ISS for up to 11 days.

The HTV Mission Control monitoring by the ISS Flight Director at the MCC-H is provided by analysing a subset of the processed HTV telemetry available from the HTV CC.

The HTV Spacecraft Performance monitoring by the NASA Automated Rendezvous Officer at the MCC-H is provided by analysing the complete set of HTV telemetry available from the HTV CC.

The ISS HTV MCC Ground System Service is priced based on a monthly unit of service.

The Mission Control monitoring function (including the Data Storage function) achieves a 99.5% availability of critical function as defined in JSC 12804, MCC Level A requirements, and shall not impact safety, mission success, or major scheduled milestones availability. A 99.5% reliability for 20 hours of critical functions with a maximum restore time of one minute, as defined in JSC 12804, MCC Level A requirements is provided.

The Spacecraft Performance monitoring function is provided at a minimum availability of 98% for nominal functions and in no case impact safety, mission success, or major program schedule milestones. This is provided in accordance with MCC System Functional Requirements and IPS Functional Requirements, JSC-13565, Station: ISSP Internal Ground Segment Specifications, SSP-54, 500; ISSP Requirements Document PRD/OR/PSP/OD 30000.

ISS Houston Support Room

The service delivered to the subscriber is the ISS Houston Support Room (HSR) at the Mission Control Center-Moscow (MCC-M) is an integrated ground facility that supports ISS mission planning, analysis, and backup command and control. It provides access to the capabilities of the Mission Control Center-Houston (MCC-H) and the IPS at JSC for the US Consultant Group in Moscow. It provides the interface for the mission planning

activities performed at the MCC-M and the integrated mission planning activities performed at JSC for the ISS.

The following ISS Houston Support Room Service is available for selection.

Table 1.1-3. *ISS Houston Support Service*

Service ID	Service Title	Unit of Service
1.1.1.21	ISS HSR Service at the Mission Control Center – Moscow	Month

ISS HSR Service at the Mission Control Center- Moscow

The ISS Houston Support Room (HSR) Ground System service at the Mission Control Center-Moscow provides the ground systems for the functions of Mission Planning and Backup Mission Control.

The ISS HSR Ground System service is priced based on a monthly unit of service.

The Mission Planning function is provided as subsystems of IPS that are used in the HSR for supporting spacecraft, crew planning, and analysis. The IPS Mission Planning Ground System services ensure at least 98% availability of nominal functions and in no case impact safety, mission success, or major program schedules.

The Backup Mission Control function (including the Data Storage function) achieves a 99.5% availability of critical function as defined in JSC 12804, MCC Level A requirements, and shall not impact safety, mission success, or major scheduled milestones availability. A 99.5% reliability for 20 hours of critical functions with a maximum restore time of one minute, as defined in JSC 12804, MCC Level A requirements is provided.

Data Reduction Center

The service provided to the STS subscriber is the Data Reduction Center (DRC) at the Marshall Space Flight Center (MSFC). It is a multi-purpose facility (located in building 4663) that provides to the STS subscriber the capability to support to MSFC and other centers for Shuttle, Spacelab, Payloads, and component test data analyses. The DRC acquires and processes the data sources in near real-time to meet the subscriber requirements. The DRC processes Shuttle data for booster and engine performance analysis and MSFC sponsored payloads on Space Shuttle flights. Additionally, the Spacelab Data Processing Function (SLDPF), which is integrated within the DRC, processes, generates, and delivers data products for Spacelab experiment and Spacelab systems health and status data. The DRC has the following generic capabilities and services that also encompass specific space shuttle requirements:

Telemetry Acquisition Data Processing, Decommutation, Demultiplexing, Demodulation, Engineering Units (EU) Conversion, Database Delivery, Tabulations, Format Conversion, System and Experiment Command History Processing, Anomaly Investigation, Data Copying, Standard and Customer Data Products on any media, the associated Engineering System Software Development, and Storage of Input and/or

Output Data on media that includes CD-ROM, 8 or 4 millimeter tapes, optical juke box, or in a data base format, such as the MSFC Engineering system.

The following Data Reduction Center service is available for selection.

Table 1.1-4. *Data Reduction Center Service*

Service ID	Service Title	Unit of Service
1.1.1.31	STS Data Reduction Center (DRC) Service at MSFC	Month

STS Data Reduction Center (DRC) Service at MSFC

The STS Data Reduction Center (DRC) Ground System service at the Marshall Space Flight Center (MSFC) provides the ground systems for the functions of STS Spacecraft Booster and Engine Analysis, Payload Analysis, Science Data Processing, and Data Storage.

The STS Data Reduction Center (DRC) Ground System service is priced based on a monthly unit of service.

The Spacecraft Analysis function and Data Storage function are provided at a minimum availability of 98% for nominal functions and in no case impact safety, mission success, or major program schedule milestones. The Payload Analysis function is provided at a minimum availability of 99.75% for critical functions and reliability of at least 99.75% measured over an eight hour utilization period and in no case impacts safety, mission success, or major program schedule milestones.

The Science Data Processing function is provided at a minimum availability of 98% for nominal functions and in no case impacts safety, mission success, or major program schedule milestones.

Shuttle/POCC Interface Facility (SPIF) and Attached Shuttle Payloads Center (ASPC)

The service provided to the subscriber is the Shuttle POCC Interface Facility (SPIF). It is a NASA PC-based system in the Attached Shuttle Payloads Center (ASPC) located at the Goddard Space Flight Center (GSFC) in Greenbelt, MD. The SPIF provides the subscriber with the STS Mission Control function interface for GSFC operations of the Space Shuttle Hitchhiker Project. The SPIF is the focal point of Space Shuttle technical support (i.e. health and safety, shuttle velocity, orbit data, and any Shuttle related information) for the GSFC and remote Space Shuttle Hitchhiker users interface with the JSC MCC-H. The SPIF provides Space Shuttle ancillary data including: orbit, attitude, and other parameters known as Calibrated Ancillary Service (CAS) data to Space Shuttle payload users, the Hitchhiker Project, and Flight Dynamics. The SPIF provides CAS data to subscribers in real-time in the form of: raw data blocks, subsetted parameters, and calibrated parameters via displays. The SPIF provides playback CAS from the Orbiter Data Reduction Center (ODRC) to subscribers when requested.

The SPIF also provides the public with user friendly, cost-effective, and state-of-the-art access to Space Shuttle project information**.**

The Hitchhiker Project is part of the Shuttle Small Payloads Project (SSPP) which accommodates small payloads (50 lbs. - 4000 lbs.) in carriers located in the Shuttle's unpressurized payload bay. The Hitchhiker operations are located in the Attached Shuttle Payload Center (ASPC) which provides space for Hitchhiker and SPIF operations, science support equipment, and personnel. The SPIF provides the following functions:

Pre-mission Support

- Develop Ground Data System (GDS) test plan

- Schedule and coordinate GDS elements resources for the following Mission Readiness Tests (MRT):

  – Payload to GDS Interface Verification Test (IVT)

  – GDS Integration and Test (I&T)

  – JSC IVT

- Generate briefing messages for MRTs

- Conduct MRTs

- Configure and operate SPIF equipment in support of MRTs, Joint Integrated Simulations (JISs), Goddard Internal Simulation (GISs), and data flows

- Operate the Hitchhiker provided Data Display Units (DDU) and coordinate command activity

- Monitor systems performance and apply corrective action

- Monitor data transmission and coordinate trouble shooting activities

- Develop SPIF/Hitchhiker mission interface control agreement

- Provide inputs to Hitchhiker mission documentation

- Coordinate configuration of Video Display System (VDS)

- Configuration of ASPC operations area.

Mission Support

- Configure and operate SPIF equipment in support of mission operations

- Operate DDUs and coordinate command activity with experimenters and JSC

- Monitor systems performance and apply corrective action

- Monitor data transmission and coordinate trouble shooting activities

- Coordinate with Operations Directors (ODs) and JSC for Tracking and Data Relay Satellite System (TDRSS) scheduling and conflict resolution

- Assist ODs in real-time mission re-planning

- Perform pre-pass and real-time communications briefings.

Post-mission

- Conduct playbacks of mission data

The following Shuttle/POCC Interface Facility (SPIF) and Attached Shuttle Payloads Center (ASPC) are available for selection.

Table 1.1-5. SPIF and ASPC Service

Service ID	Service Title	Unit of Service
1.1.1.41	STS SPIF and ASPC Service at GSFC	Month

STS SPIF and ASPC Service at GSFC

The STS SPIF and APSC Ground System service at the Goddard Space Flight Center (GSFC) provides the ground systems for the functions of Mission Control support, Flight Dynamics support, and Shuttle Hitchhiker Payloads support.

The STS SPIF and ASPC Service is priced based on a monthly unit of service.

The Mission Control support function achieves a TBD availability of critical function as defined in TDB.

The Hitchhiker Payload support function is provided at a minimum availability of 99.75% for critical functions and reliability of at least 99.75% measured over an eight hour utilization period and in no case impacts safety, mission success, or major program schedule milestones.

Payload Operations Integration Center

The service provided to the ISS subscriber is the Payload Operations and Integration Center (POIC) at MSFC. The POIC can support other programs, but is currently an International Space Station (ISS) facility that allows the execution of on-orbit ISS payloads and payload support systems in coordination with the following: the Mission Control Center in Houston (MCC-H), the distributed International Partner (IP) Payload Control Centers (PCCs), Telescience Support Centers (TSCs), and payload-unique facilities. The POIC is comprised of the Payload Data Services System (PDSS), the Enhanced Huntsville Operation Support Center (HOSC) System (EHS), the Payload Planning System (PPS), and the Enhanced Mission Communications System (EMCS). The PDSS acquires, stores, and distributes ISS data to the EHS, IPs, TSCs, and other payload–unique facilities. The EHS performs command processing and real-time and near-real-time telemetry processing for pre-launch integration and checkout, simulation training, and flight operations. The PPS provides a set of software tools to automate planning and schedule payload activities. The EMCS receives voice, video, and data from external interfaces and distributes voice, video, and data to the POIC user community. Video is distributed by JSC for ISS.

The POIC and its supporting systems (PDSS, EHS, PPS, and EMCS) reside primarily within the Marshall Space Flight Center (MSFC) HOSC. The United States Operations Center (USOC) also resides within the HOSC and provides an ISS host facility where payload users can choose to control and monitor the operations of the on-board

payloads instead of being located remotely. The USOC users are provided with access to EHS workstations, POIC networks, facility space, and POIC voice and video systems.

The Telescience Resource Kit (TReK) is one of the Payload Operations Integration Center (POIC) Remote Operations configuration options. This option is suitable for small experiment teams or individuals who want to monitor and control low data rate payloads.

TReK consists of a Personal Computer (PC), configured with Commercial Off-the-Shelf (COTS) software, shareware, freeware, and POIC-provided interface software to provide the same basic functions as a POIC workstation.

Capabilities provided by TReK include the capability to receive, process, record, and forward real-time and playback telemetry, uplink and update payload commands, perform local exception monitoring, local calculations, word processing, file management, and control telemetry and command processing using local databases. Information needed to populate a TReK database can be downloaded from a supporting facility (POIC or Telescience Support Center) database. Mission execution and mission planning tools can also be accessed from a TReK system. For more information on TReK, please see the URL listed below:

http://payloads.msfc.nasa.gov//trek/.

The following Payload Operations Integration Center services are available.

Table 1.1-6. *Payload Operations Integration Center Services*

Service ID	Service Title	Unit of Service
1.1.1.51	ISS Utilization POIC Service at MSFC	Month

ISS Utilization POIC Service at MSFC

The ISS Utilization POIC Ground System service at the Marshall Space Flight Center provides the ground systems for the functions of Mission Planning, Mission Control, Spacecraft Analysis, Payload Analysis, Science Data Processing, and Data Storage.

The ISS Utilization POIC Service is priced based on a monthly unit of service.

The ISS Utilization POIC service is provided at a standard of excellence for critical functions of at least 99.95% availability and an operational expectation for critical functions of 99.75% and in no case impacts safety, mission success, or major program schedule milestones.

The ISS Utilization POIC service is provided at a reliability standard of excellence of 99.95% and a reliability expectation of 99.75%. This is measured over an eight-hour mission period of an utilization of flight and other major support periods and in no case impacts safety, mission success, or major program schedule milestones.

Human Space Flight Electronic Systems Test Laboratory

The service provided to the subscriber in the Human Space Flight Electronic Systems Test Laboratory (ESTL) at the Johnson Space Center Building 44 is end-to-end testing of human spacecraft communications systems with required relay satellites and ground elements in a controlled RF environment. This facility is used for design evaluation, RF interface compatibility, and system performance verification testing of human spacecraft RF communications systems and their interfaces with external (ground stations, relay satellites, detached payloads, etc.) elements.

Significant features of the ESTL include the following:

1. Five RF shielded enclosures for spacecraft testing

2. Two ground stations: One GSTDN direct link ground station and a dual string version of the newly upgraded Second TDRS Ground Terminal and White Sands TDRS Ground Station

3. A TDRS communication system with S-band single access (SSA) and Ku-band single access (KSA) capability

4. Unique test instrumentation systems, including Dynamic Doppler Frequency effects and accurate, controlled, dynamic space loss simulation

5. Space Shuttle Orbiter Ku-band, S-band, and ultrahigh frequency (UHF) prototype and/or qualification units

6. A roof mounted, 16-foot S-band antenna system

7. Three antenna radomes for RF transmission/reception from on orbit spacecraft or TDRS's

The following ESTL service is available.

Table 1.1-7. Electronic Systems Test Laboratory Service

Service ID	Service Title	Unit of Service
1.1.1.61	Human Space Flight Electronic Systems Test Laboratory (ESTL) at JSC	Month

Human Space Flight Electronic Systems Test Laboratory (ESTL) at JSC

The Human Space Flight Electronic Systems Test Laboratory (ESTL) service at the Johnson Space Center provides for human spacecraft communications systems to required relay satellites and ground elements RF end-to-end tests as required by the subscribers.

The ESTL service is priced based on a monthly unit of service.

Other Ground System Services

Table 1.1-8. Other Ground System Services

Service ID	Service Title	Unit of Service
1.1.3.01	Checkout and Launch Support	Month

Table 1.1-8. *Other Ground System Services*

Service ID	Service Title	Unit of Service
1.1.4.01	Expendable Launch Vehicle Telemetry Laboratory	Month
1.1.5.01	Hubble Space Telescope	Month

Ground System Service for Checkout and Launch Support

Checkout and Launch support Ground System services for mission control are provided at a minimum reliability of 99.5% with a maximum restore time of 30 minutes and in no case impact safety, mission success, or major program schedule milestones. The Checkout and Launch Control Systems for STS processing and launch operations have a minimum availability of 98% and in no case impact safety, mission success, or major program schedule milestones.

Ground System Service for Expendable Launch Vehicle Telemetry Laboratory

Monitoring of ELV ground support and flight systems are supported by the ELV Telemetry Station located at the Cape Canaveral Air Station (CCAS) and Vandenberg Air Force Base (VAFB). The principal function of the ELV Telemetry Station is to provide telemetry, real-time software operations, and communication support for ELV launches and NASA-sponsored spacecraft for ground processing and launch through loss of vehicle telemetry. This support includes system engineering for telemetry, data processing, audio communications, data transmission, and closed-circuit television systems. Also included is operational planning and real-time support for data acquisition and communication support.

Ground system services for the KSC ELV Telemetry station are provided at 98% reliability. This is measured over the period of an ELV launch countdown (L–3 hours through T–0) and other major support periods (wet dress rehearsal for Atlas and flight program verification for Delta) and in no case impact safety, mission success, or major program schedule milestones.

Ground System Service for Hubble Space Telescope

This service is provided to the HST subscribers who use CSOC facilities to support their mission requirements, but the flight operations team function is provided under a non-CSOC arrangement.

Ground System services include those functions required for preparing the facility for mission services in support of launch, checkout, on-orbit operations, and real-time operations and shuttle service missions. This service includes the following activities:

Computer Operations Support. The computer operations team will setup the ground system, verify data paths, checkout required voice communications, ensure proper software and database configuration, coordinate any required maintenance, and participate in pre and post contact briefing activities.

Hardware Maintenance. The hardware maintenance function includes activities required to maintain the ground system in a mission support capability. These activities include

installation of subscriber provided equipment and updates, preventive and corrective maintenance and replacement of CSOC equipment as needed to maintain original hardware configuration. Services are provided on a four-hour response to a properly executed request for service. Key component parts are kept onsite and overnight air is used to augment the spares as needed.

System Administration. The system administration function provides the support required for maintaining the ground system software/firmware, commercial-off-the-shelf and subscriber provided applications in the authorized system configuration. This function is responsible for maintaining a secure AIS environment using the provided tools.

Mission Operations Center Staff. The MOC staff develops procedures and performs the data accountability function for all data received in the MOC facility. The MOC staff coordinates activities, schedules equipment support internal to the facility, and provides operational oversight and status reporting. The staff ensures activities are in accordance with the ISO 9001 certification.

Software Maintenance. Software maintenance is performed as a CSOC responsibility for all ground systems that have been transferred to the CSOC contract. Special arrangements are available for maintenance of software licenses prior to maintenance of the ground system software being transferred to CSOC. Normally CSOC will maintain the ground system in an as delivered configuration. Enhancements to the system other than those required to maintain delivered capability are not provided.

Mission Specific Launch Trajectory Services

Table 1.2.2-10. *Launch Trajectory Services*

Service ID	Service Title	Unit of Service
1.2.2.93	Comprehensive Network Support for STS Missions	Mission

Comprehensive Network Support for STS Missions

STS support is offered as a single service including launch, on-orbit, and landing acquisition support. Launch phase services include contingency landing support (RTLS, TAL, AOA). On-orbit phase services include backup STS orbit determination in the event of Emergency Mission Control Center (EMCC) activation, as well as routine hourly acquisition data updates. Support includes standard network testing and verification simulations.

Mission Specific Network Services

Table 2.0-2. *Summary of Network Services*

Service ID	Service Title	Unit of Service
2.1.1.05	Unmanned On-Orbit Support for IMP-8 VHF	Minute
2.2.1.06	Space Network Single Access Terrestrial, Residual Asset	Minute

Unmanned On-Orbit Support for IMP-8 VHF

Orbital support to IMP-8 is provided on a scheduled basis via the Ground Network resources at Wallops Flight Facility. It can include the standard services of data acquisition, commanding, tracking, and scheduling as requested by the project. The systems used to provide this support are not automated to any degree and require operator intervention to accomplish the requested support. This support is available during the IMP-8 view periods.

SA Terrestrial, Residual Asset

Defined as unique service support negotiated with individual programs/projects, using residual TDRS capacity. Residual TDRS capacity strictly defined is a TDR spacecraft that is no longer capable of a full suite of SA S-band, Ku-band (KSA) or MA services. As currently implemented, this service also uses alternative ground control systems (e.g., WSC Alternate Relay Terminal, WART) and data acquisition systems uniquely developed outside the normal WSC ADPE/GCE. This category of service presumes an option to recover unusual and direct costs associated with the unique implementation requirements as well as the recurring service fees. The unit of service is per minute of support.